

REMARKS

Claim 1 is amended to incorporate the subject matter of claim 9. Support for this amendment can be found at, for example, original claim 9.

Claims 6, 7, 8, 9, and 11 are canceled.

Upon entry of the above amendment, which is respectfully requested, claims 1, 4, 10, 12, and 16-20 will be pending.

Objection to the Claims

On page 2 of the Office Action, claims 14 and 16 are objected to as depending upon claim 3, which is canceled. The Examiner treated the claims as if they depended from claim 1 for the purpose of the last Office Action.

Applicant respectfully submits that the Amendment filed January 28, 2010 overcomes this objection. Namely, the amendment to claims 14 and 16 overcomes this objection, such that present claims 14 and 16 no longer depend from a canceled claim.

Withdrawal of the objection to claims 14 and 16 is respectfully requested.

Rejection Under 35 U.S.C. § 103

On page 3 of the Office Action, claims 1, 4 and 6-17 are rejected under 35 U.S.C. § 103(a) over “Petritsch” (U.S. Patent No. 6,340,789) in view of “Stossel” (U.S. Patent No. 7,223,484) as evidenced by “Asfandiarov” (Investigation of Electron Structure of 2,1,3-Benzothiadiazole Derivatives by Means of Negative Ion Mass Spectrometry, Photoelectron Spectroscopy and Absorption Spectroscopy; Rapid Commun. Mass Spectrom. 12, 595-602,

1998), “Nakaya” (U.S. Patent No. 5,792,557) and “Kimura” (U.S. Patent Application Publication 2003/0072965).

On page 14 of the Office Action, claims 18-20 are rejected under 35 U.S.C. § 103(a) over Petritsch in view of Stossel as evidenced by Asfandiarov, Nakaya, and Kimura as applied to claim 17, and further in view of “Iwasaki” (U.S. Patent Application Publication 2003/0209651).

Applicant respectfully submits that there no teaching, suggestion, motivation, or other reason to modify the cited references to add the compound of formula (II) of Kimura to reach the presently claimed invention with a reasonable expectation of success.

Present claim 1 recites “said at least one electron transporting organic material is a compound represented by formula (VIII).” None of Petritsch, Stossel, Asfandiarov, Nakaya or Iwasaki disclose the compound represented by formula (VIII) recited in present claim 1. The Examiner relies on Kimura to teach a compound represented by formula (VIII).

However, the disclosure of Kimura relates to an organic electroluminescence device. See Abstract of Kimura. The presently claimed invention relates to a photoelectric conversion element. Therefore, Kimura does not teach or suggest using the electron transporting compound represented by formula (II) of Kimura for a photoelectric conversion element.

It is non-obvious that an electron transporting compound used in organic electroluminescence devices could be simply used in photoelectric conversion elements with a reasonable expectation of success, because it is difficult to obtain a photoelectric conversion element by simply applying an electron transporting compound used in an organic electroluminescence device.

In organic electroluminescence devices, like Kimura, electron transporting compounds can enhance luminescence properties, even if film defects are present in the layer, as long as the electron transporting compounds are capable of conducting a large amount of current against applied voltages without allowing holes. That is, any materials having high electron mobility and having a property of not allowing holes can be used for organic electroluminescence devices, even if the layer contains some amount of film defects.

On the other hand, photoelectric conversion elements have a problem to be solved, which is not a problem for organic electroluminescence devices. Specifically, photoelectric conversion elements should suppress dark current to low levels.

In a photoelectric conversion element, if the layer has film defects, carriers present in the film defects cause a large amount of dark current flow. This large amount of dark current flow would be a fatal flaw in photoelectric conversion elements.

In order to provide a photoelectric conversion element having high quality, it is important to suppress sources which generate carriers for dark current. Film defects are a major source of carriers for dark current.

Whether an electron transporting compound shows advantageous effects in a photoelectric conversion element or not is dependent on its film properties. However, the film properties are specific to the material used. That is, even a person of ordinary skill in the art could not easily determine whether the electron transporting compound shows advantageous effects in a photoelectric conversion element or not, without conducting actual experiments and evaluations.

As such, a person of ordinary skill in the art would not expect to obtain a photoelectric conversion element having high quality by simply applying electron transporting compounds used in organic electroluminescence devices to the photoelectric conversion element.

Applicant discovered that a photoelectric conversion element showing high quantum efficiency can be achieved by using a compound represented by formula (VIII) as an electron transporting compound of the photoelectric conversion element.

Accordingly, it is not obvious to combine the photoelectric conversion element of Petritsch with the electron transporting compound of Kimura, which is for an organic electroluminescence device, to obtain the photoelectric conversion element of the presently claimed invention.

Claims 6, 7, 8, 9, and 11 are canceled, which renders this aspect of the first § 103 rejection moot.

Claims 4, 10, 12, and 16-20 depend from claim 1, either directly or indirectly.

Therefore, Applicant respectfully submits that present claim 1 and claims dependent thereon are non-obvious. Reconsideration and withdrawal of the § 103 obviousness rejections are respectfully requested.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

AMENDMENT UNDER 37 C.F.R. § 1.114(c)
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